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## DEPARTMENT OF PHYSICS AND ASTRONOMY

### The OVI Issue, Part II

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Local Bubble II: April 21<sup>st</sup>-24<sup>th</sup> 2008

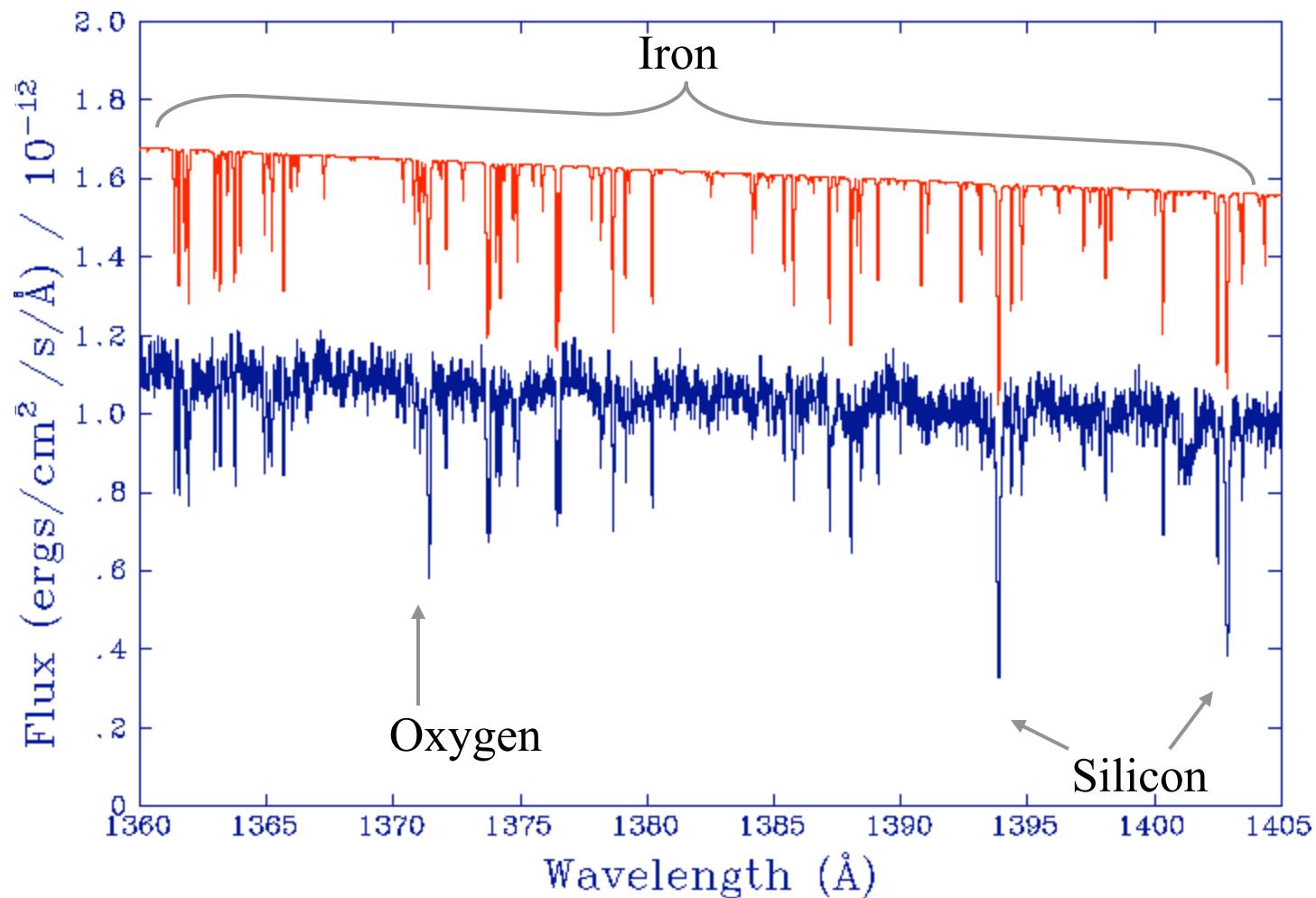


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# Introduction

- White Dwarf spectra in the far-UV
  - Photospheric, interstellar and circumstellar material
- Our new analysis of the FUSE sample
- Location of OVI in the Local Bubble /Cavity
- Conclusions

# White Dwarf Composition

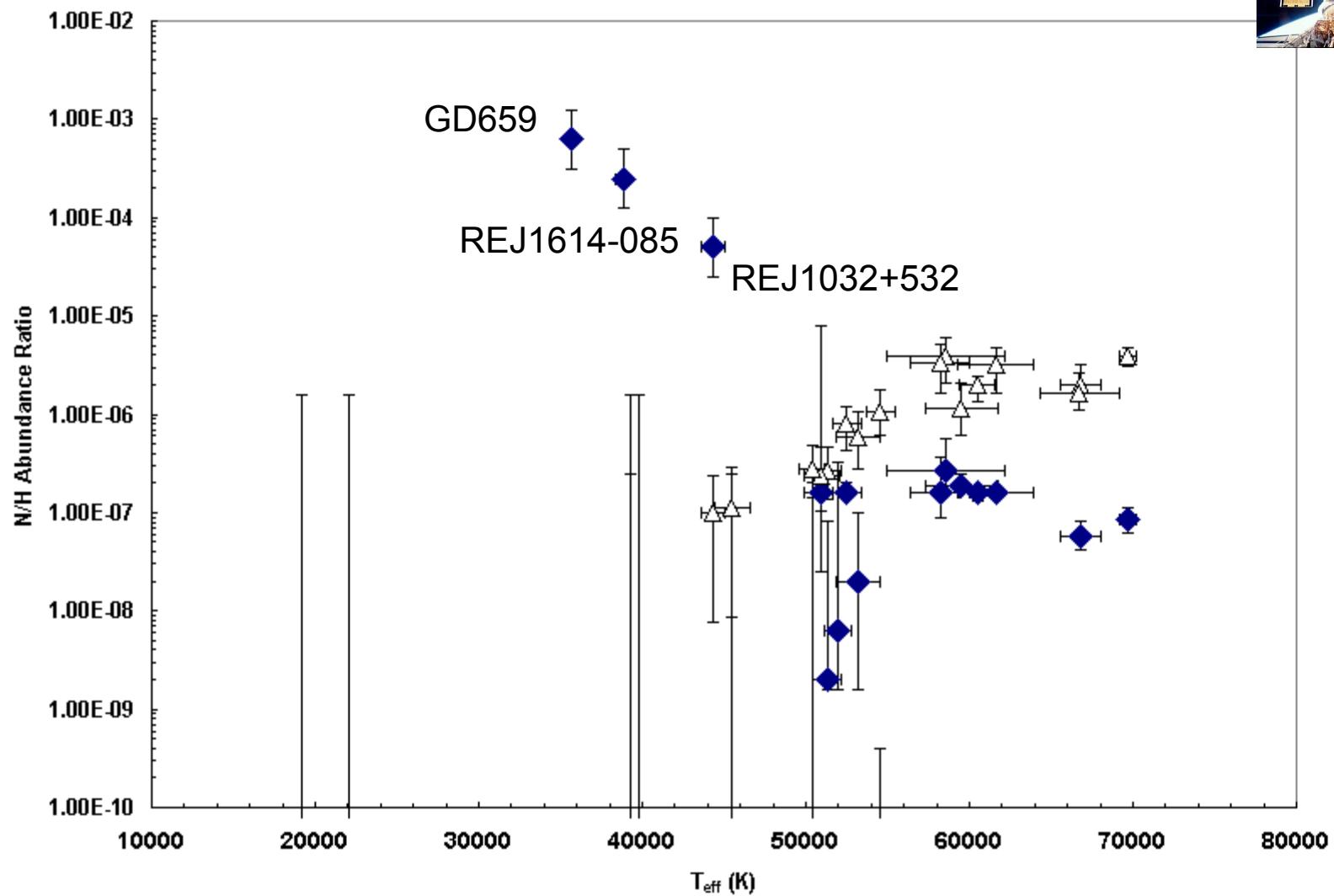


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# Nitrogen (N<sub>v</sub>)

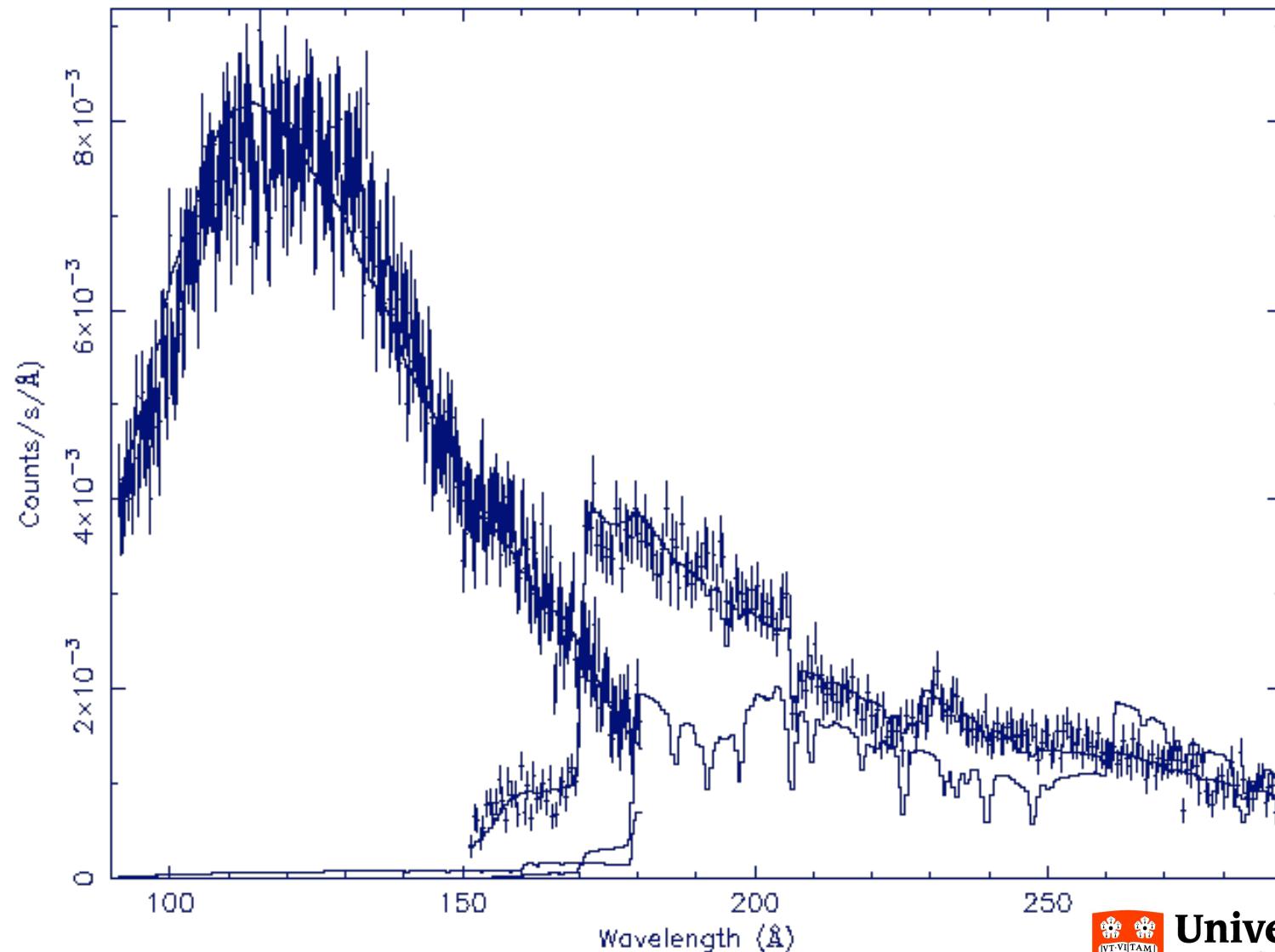


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# Stratification of nitrogen

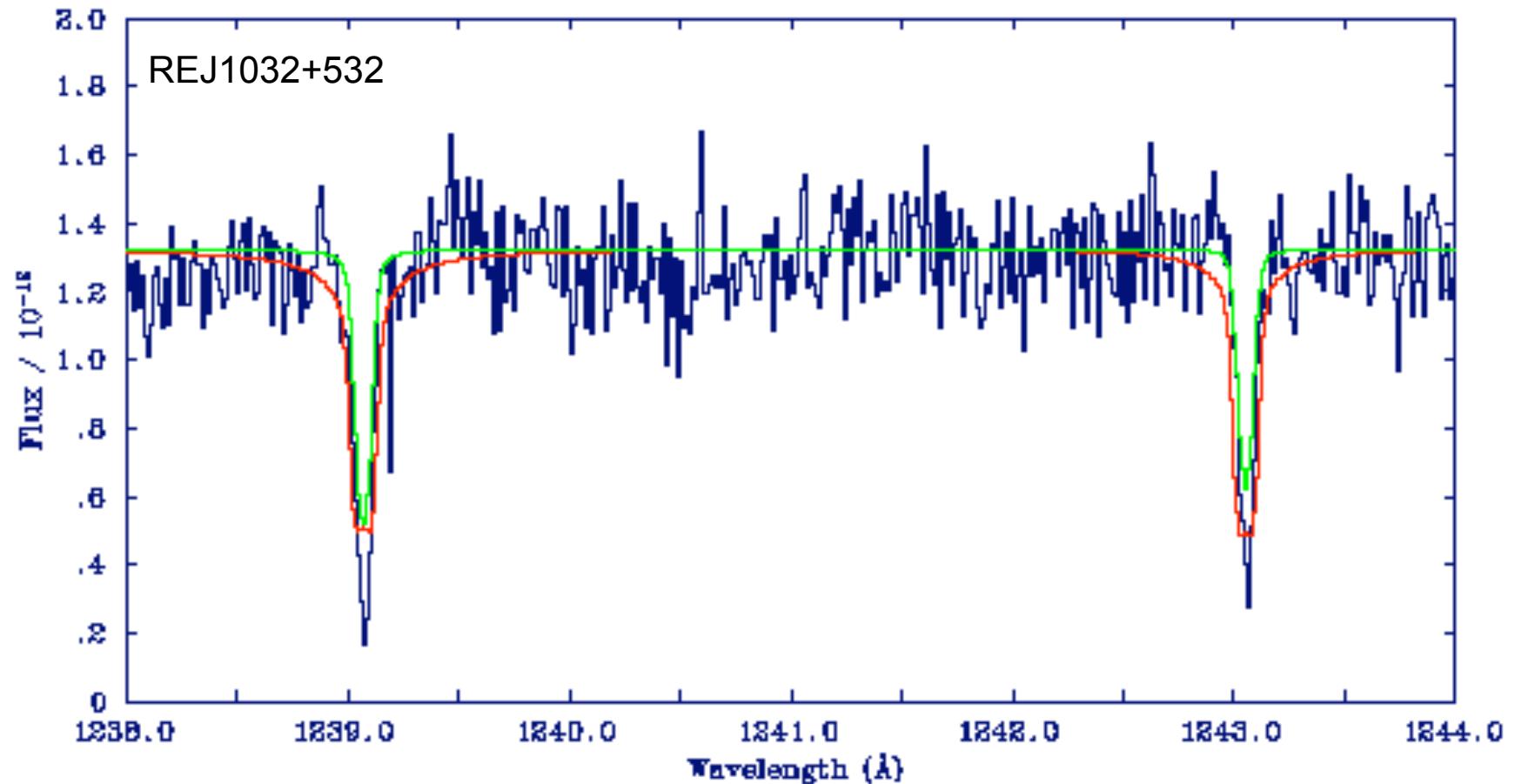


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# Stratification of nitrogen



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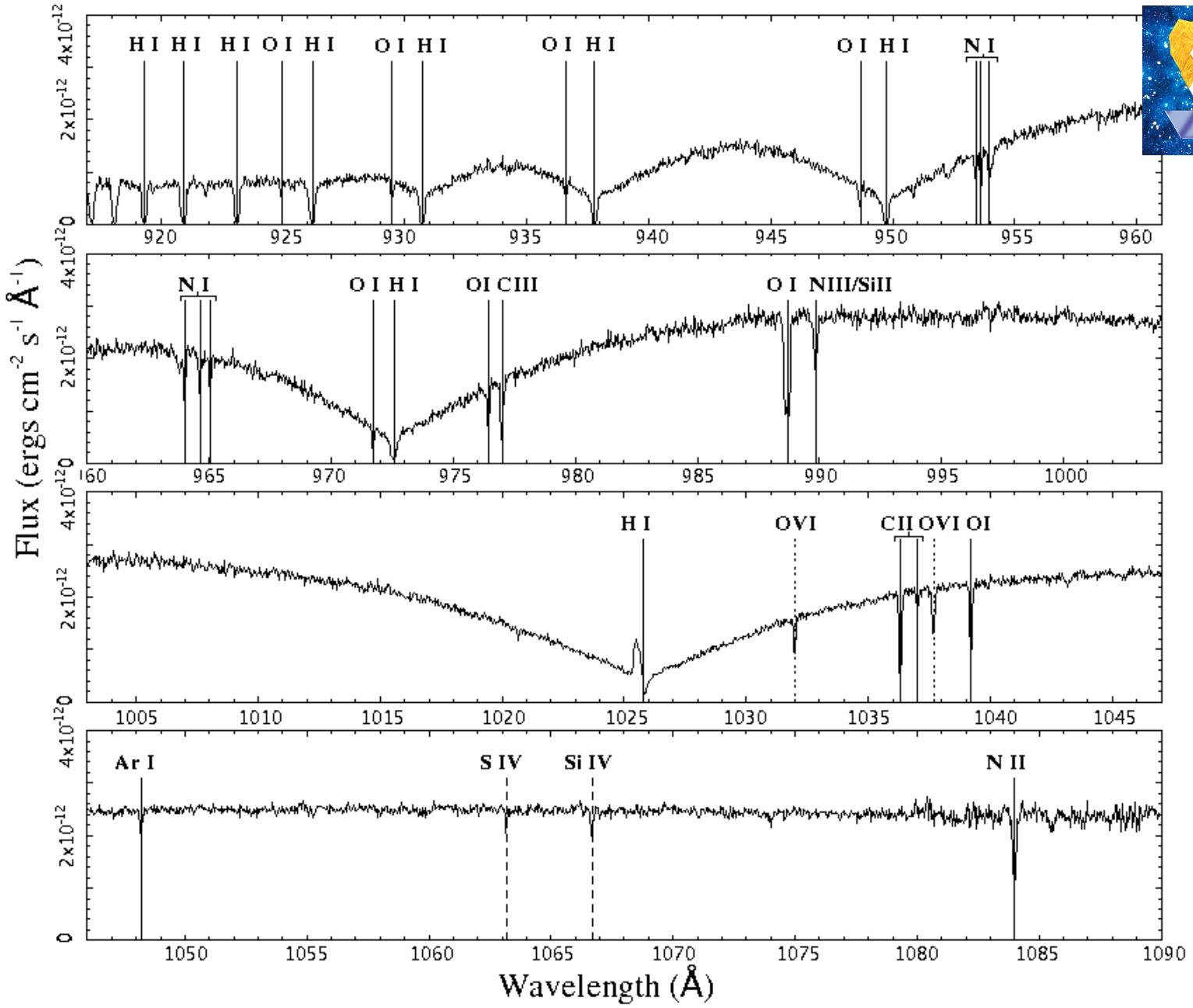
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# Summary

- Conventional view
  - White dwarf composition has a strong dependency on  $T_{\text{eff}}$
  - Balance of radiative levitation vs. gravity
  - High ionization in cooler stars not photospheric
- But stratified high ionization material CAN be present in cooler stars!
  - Almost all WDs have photospheric material (e.g. Pv in GD71 @ 33,000K; Dobbie et al. 2005)
  - OVI seen <45,000K could be photospheric
- Best (only?) discriminant between photosphere and ISM is radial velocity

# FUSE Observations

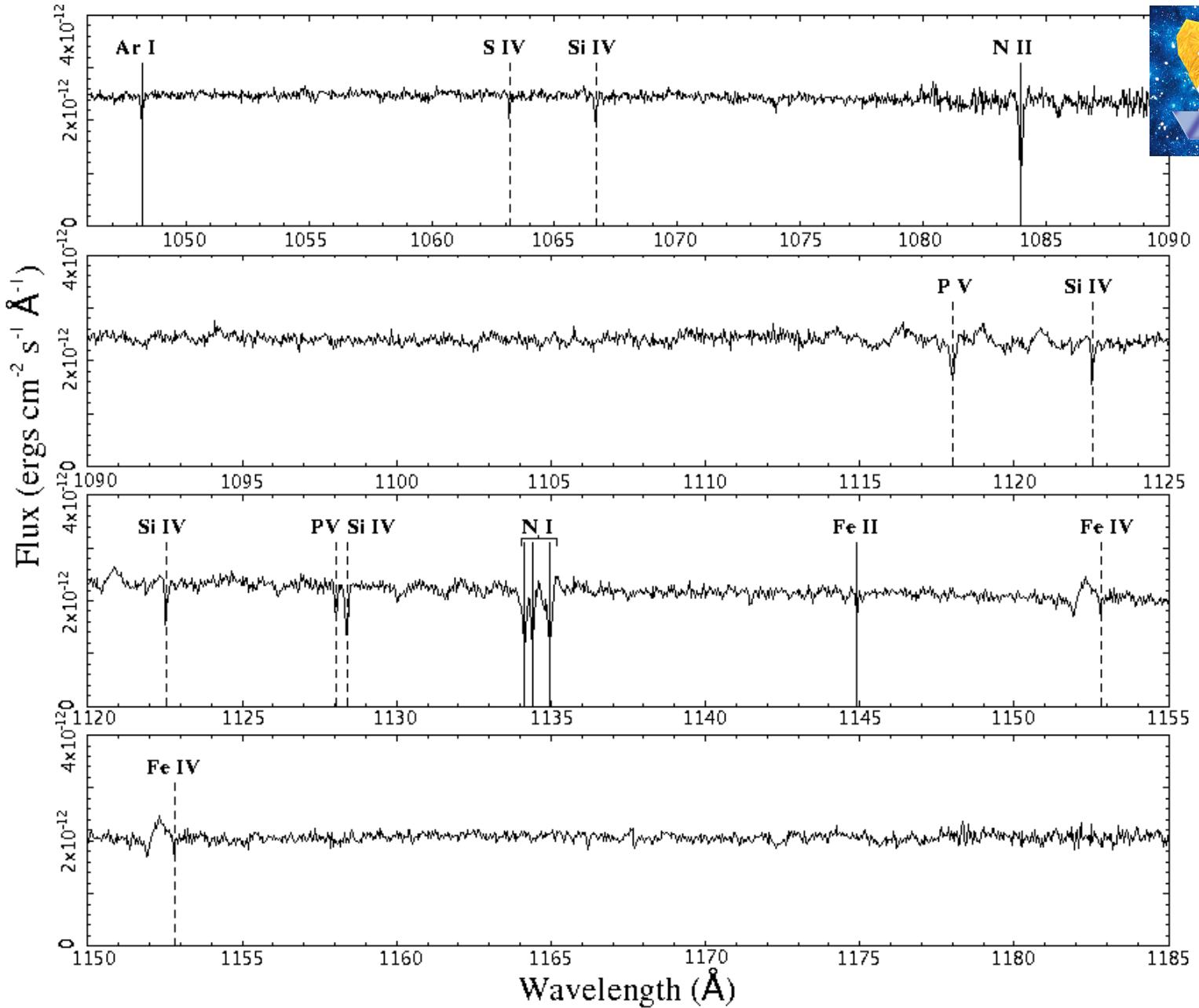
- Previous work on OVI with FUSE
  - Oegerle et al., 2005, ApJ, 622, 389
  - Savage & Lehner, 2006, ApJS, 162, 134
- Our work
  - Uniform data processing (latest pipeline)
  - Larger stellar sample (83 vs. 46)
  - New photospheric velocity analyses
  - Compare results with LISM density maps



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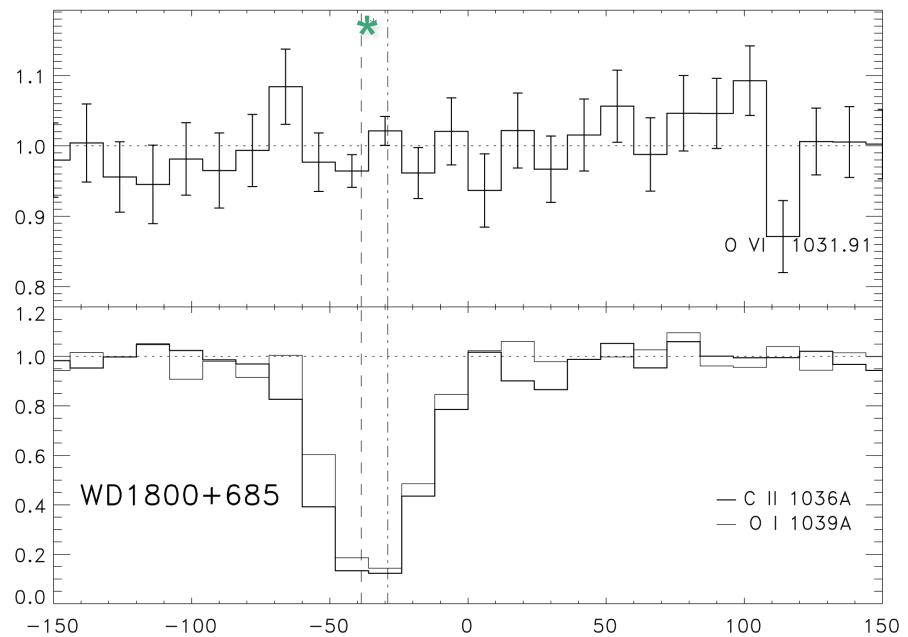
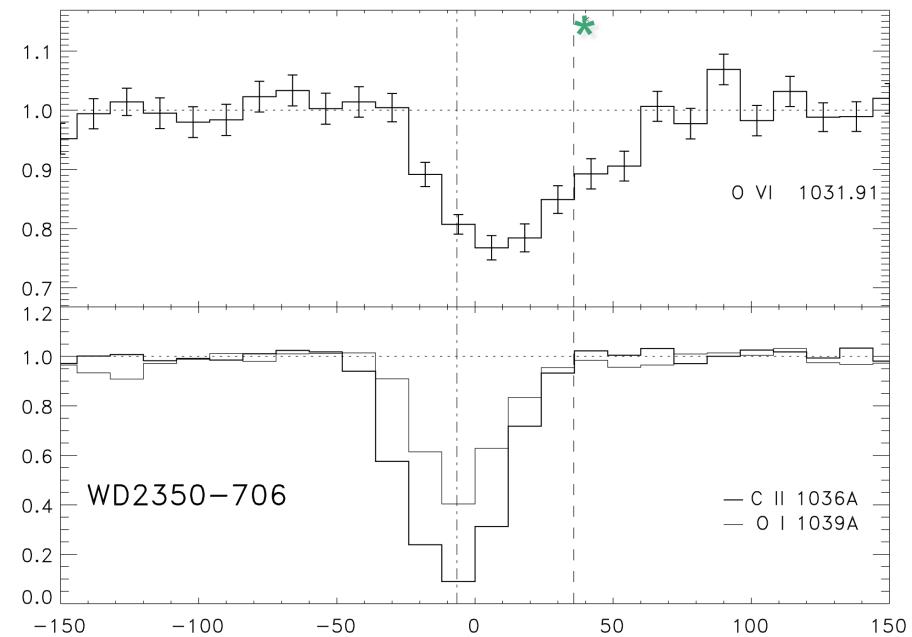
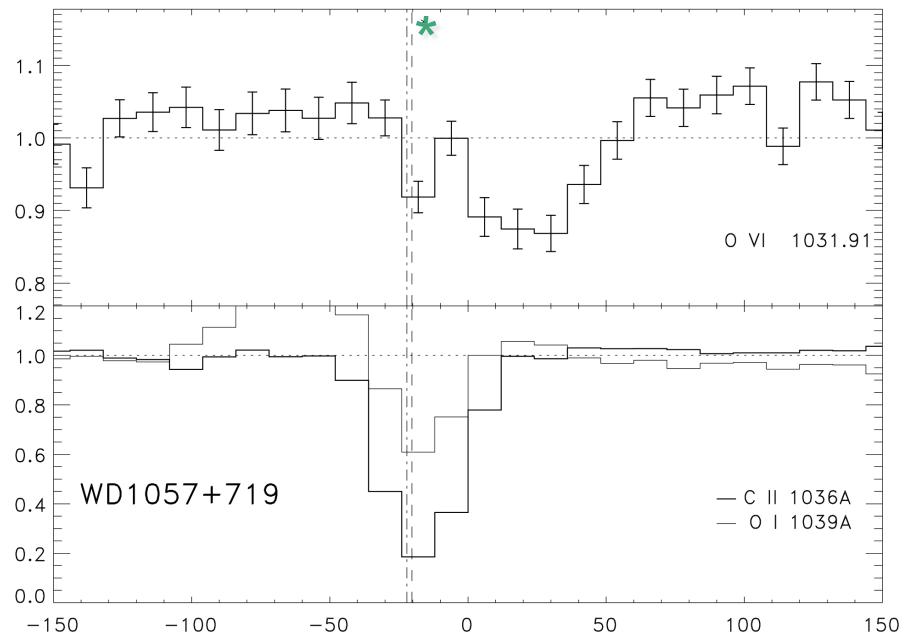
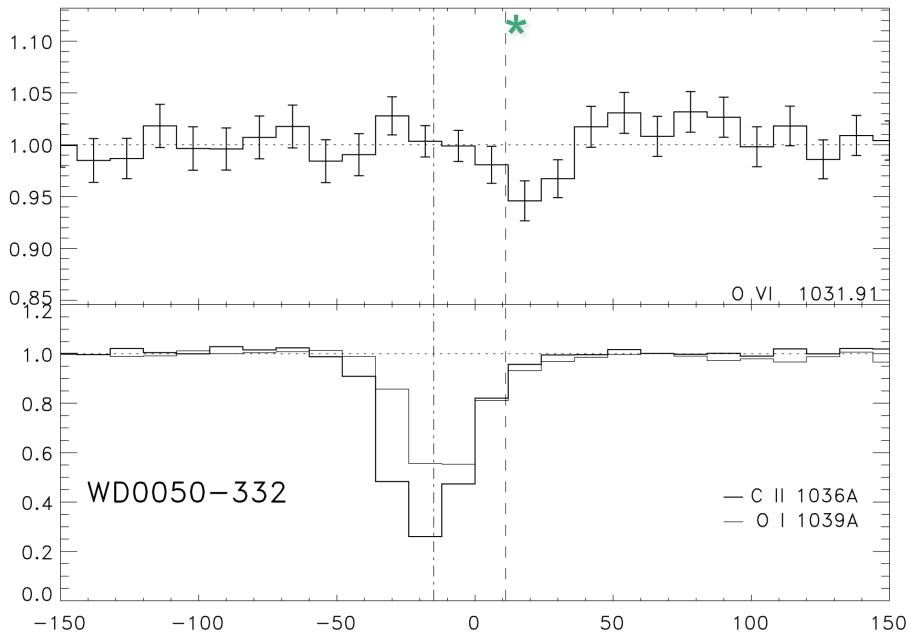
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# Example Results

Star	$v_{\text{phot}}$	$v_{\text{ism}}$	$\delta v$	$v_{\text{OVI}}$	Comment
WD2350-706	35.7	-6.5	42.3	10.6	IR
WD2331-475	22.5	-0.7	23.2	3.0	I
WD1029+537	13.8	-22.8	36.6	25.7	P
WD0050-332	11.1	-14.9	26.0	13.7	P
WD0501+524	21.5	14.3	7.2	20.4	?
WD2321-549	12.5	-16.6	29.2	-1.6	I & P
WD2257-073	15.3	-10.2	25.5	30.8	IR
WD2152-548	-3.8	-1.6	-2.3	-2.6	?

Key: I = interstellar at CII/OI velocity; P = photospheric

IR = interstellar redshifted wrt CII/OI

? = cannot distinguish

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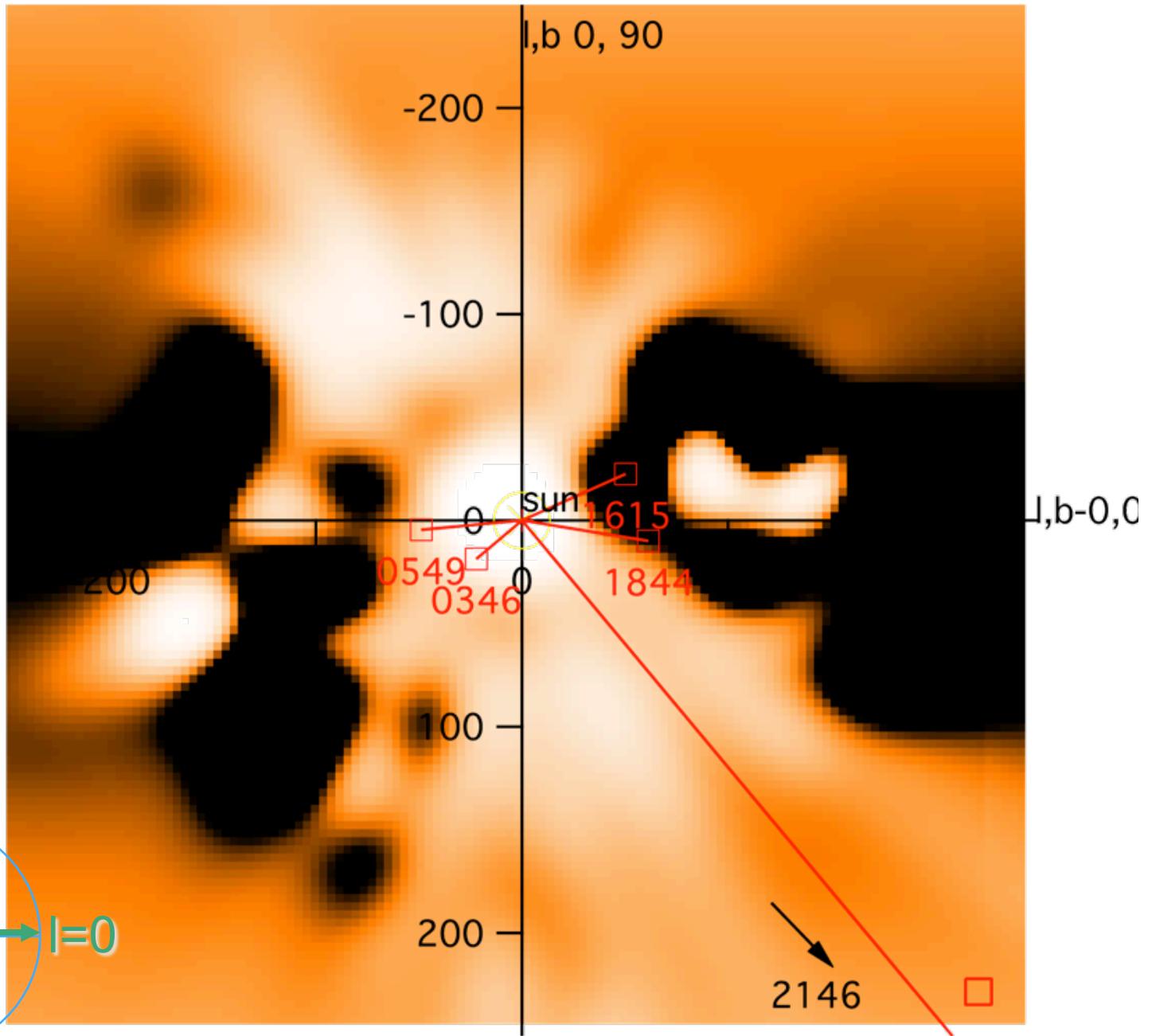
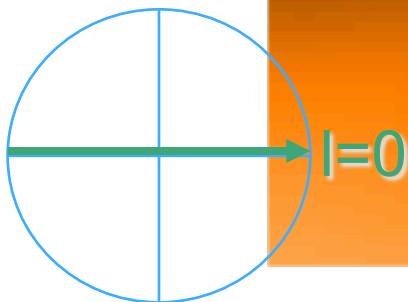


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# Summary of Results

- We detect ISM OVI in 14 stars
  - 3 I, 7 IR, 4 blend of I and P
  - 15 clearly photospheric only
  - 17 OVI detected but not resolved
  - 37 non-detections > upper limits
- How do these compare with e.g. Savage & Lehner
  - 6 ISM detections in agreement
  - 14 ISM detections we believe are P/?/ND
  - 1 ND and 1 P that we have as ISM detections
  - 14 non-detections in agreement
- Main differences due to new photospheric velocity measurements

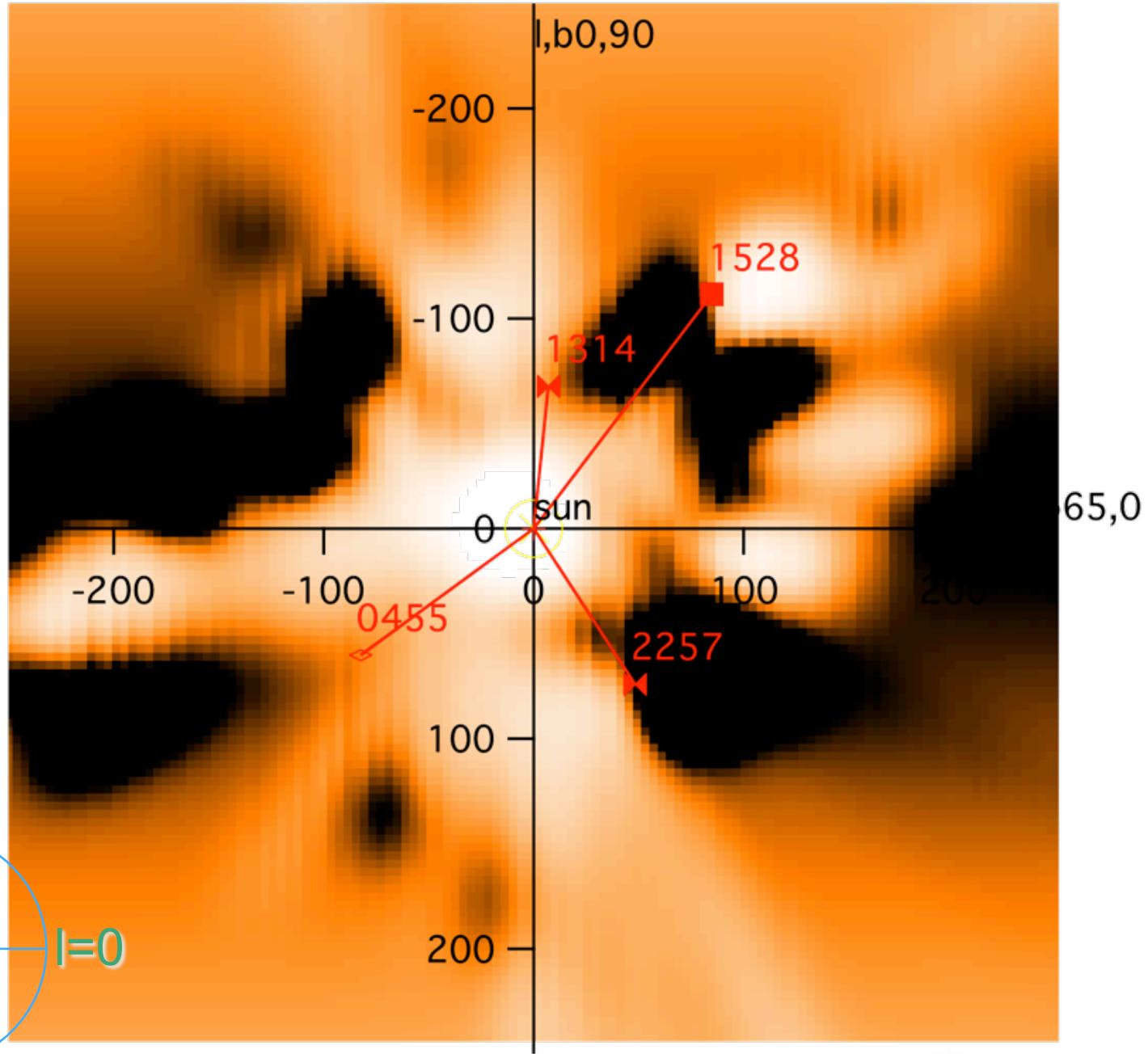
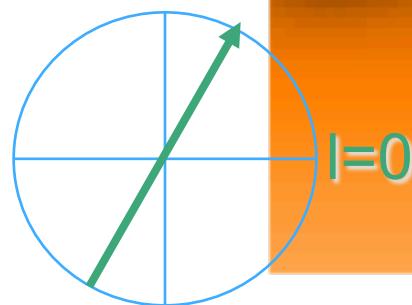




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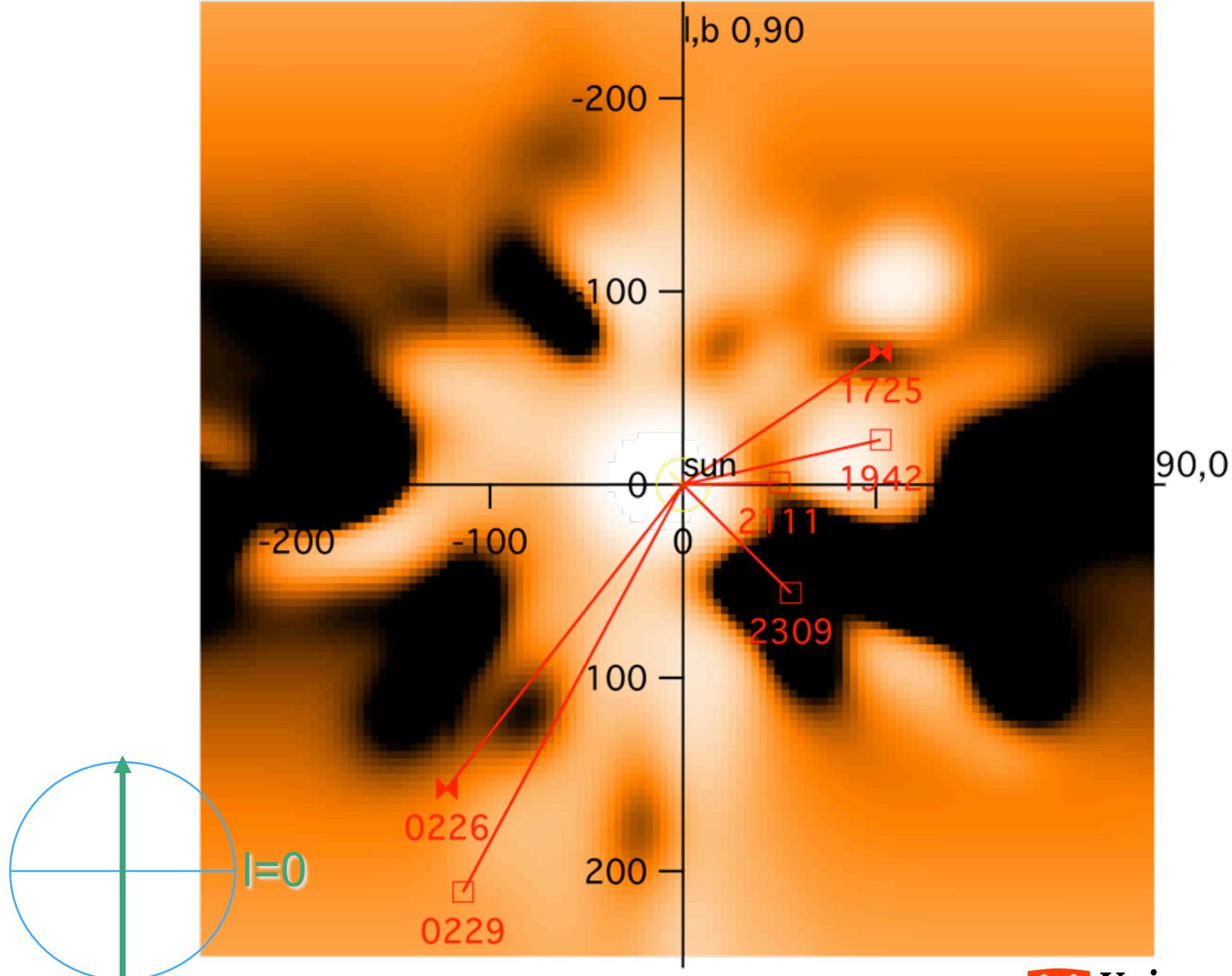
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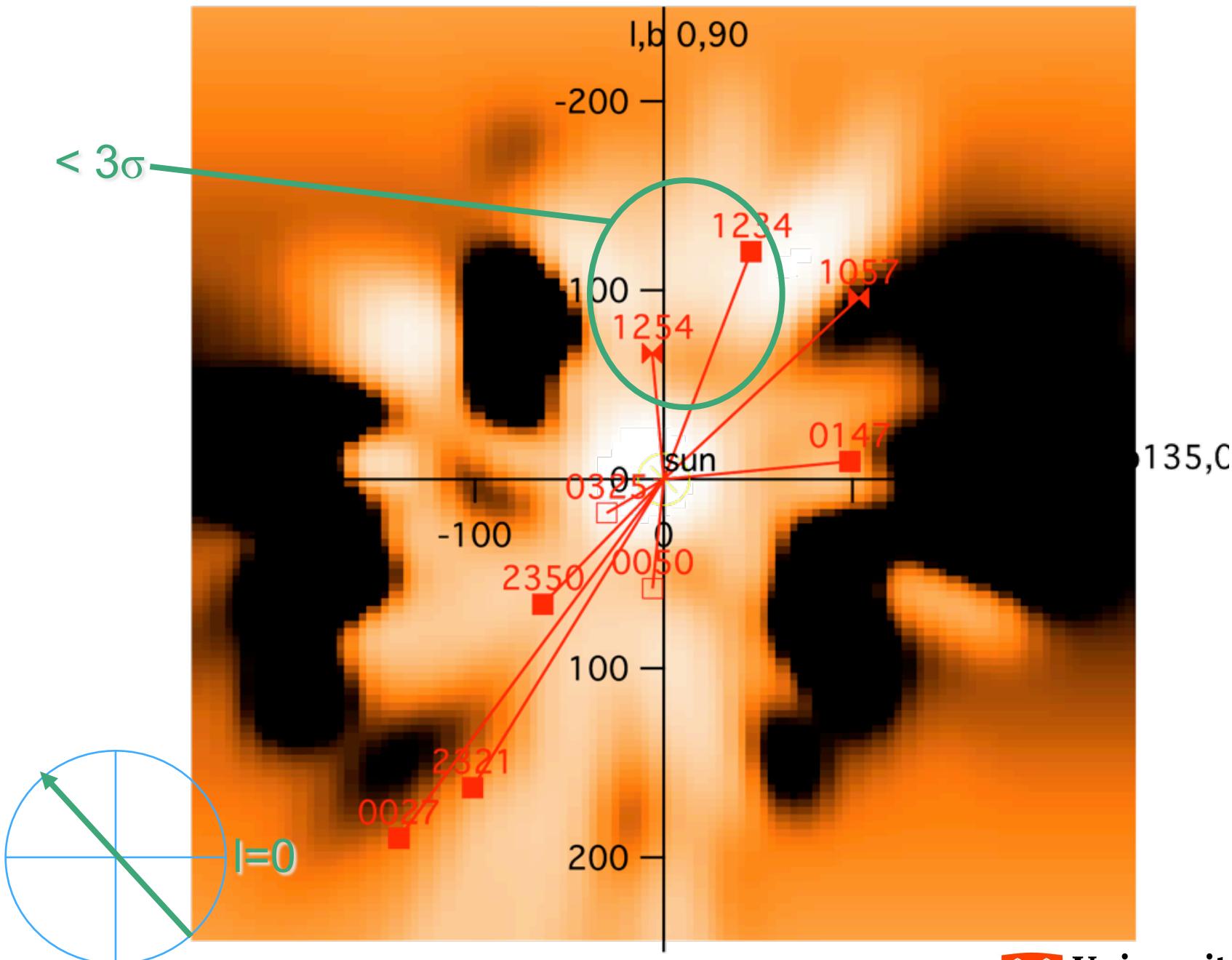
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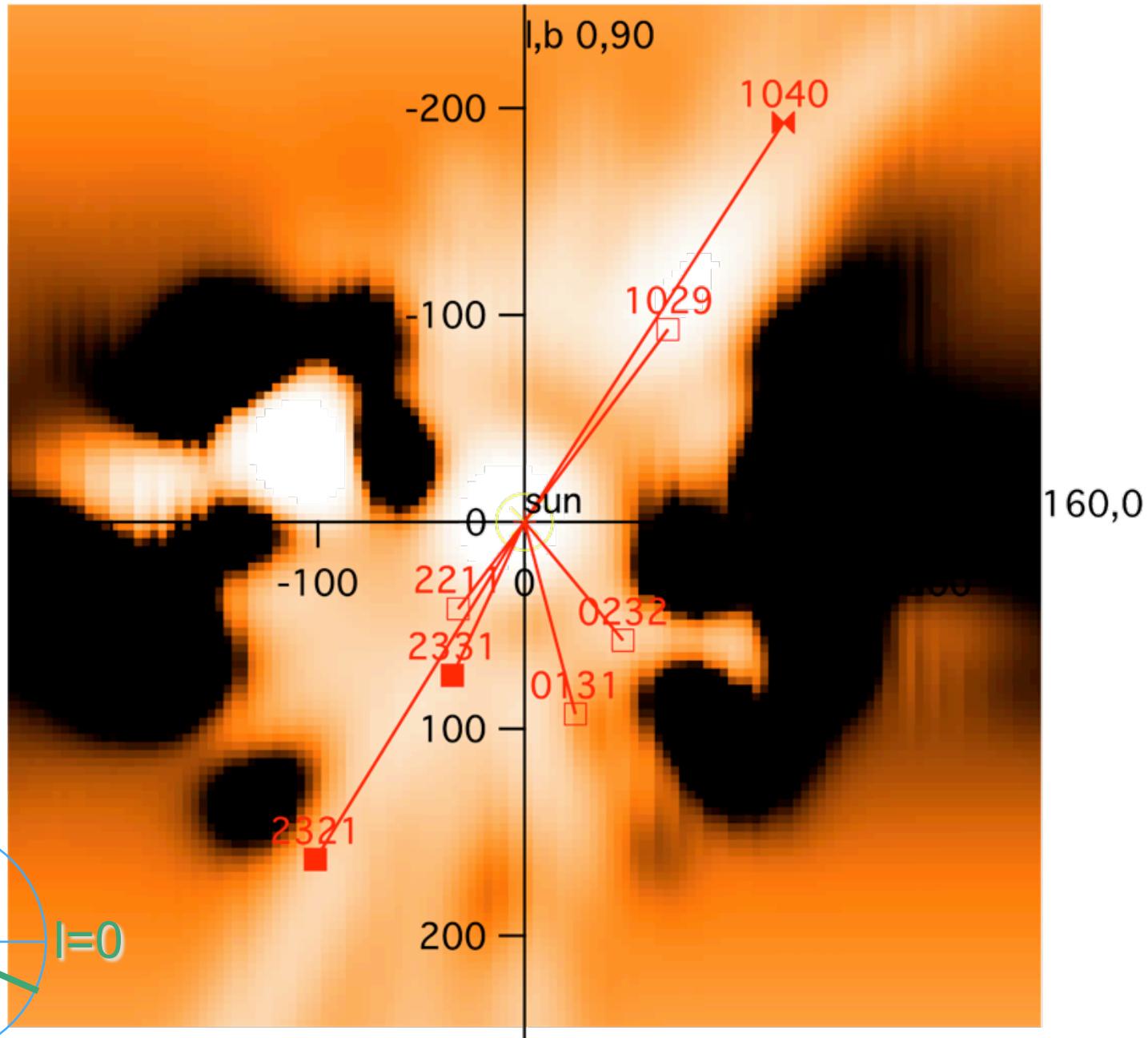
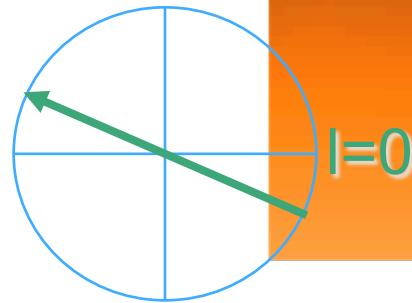
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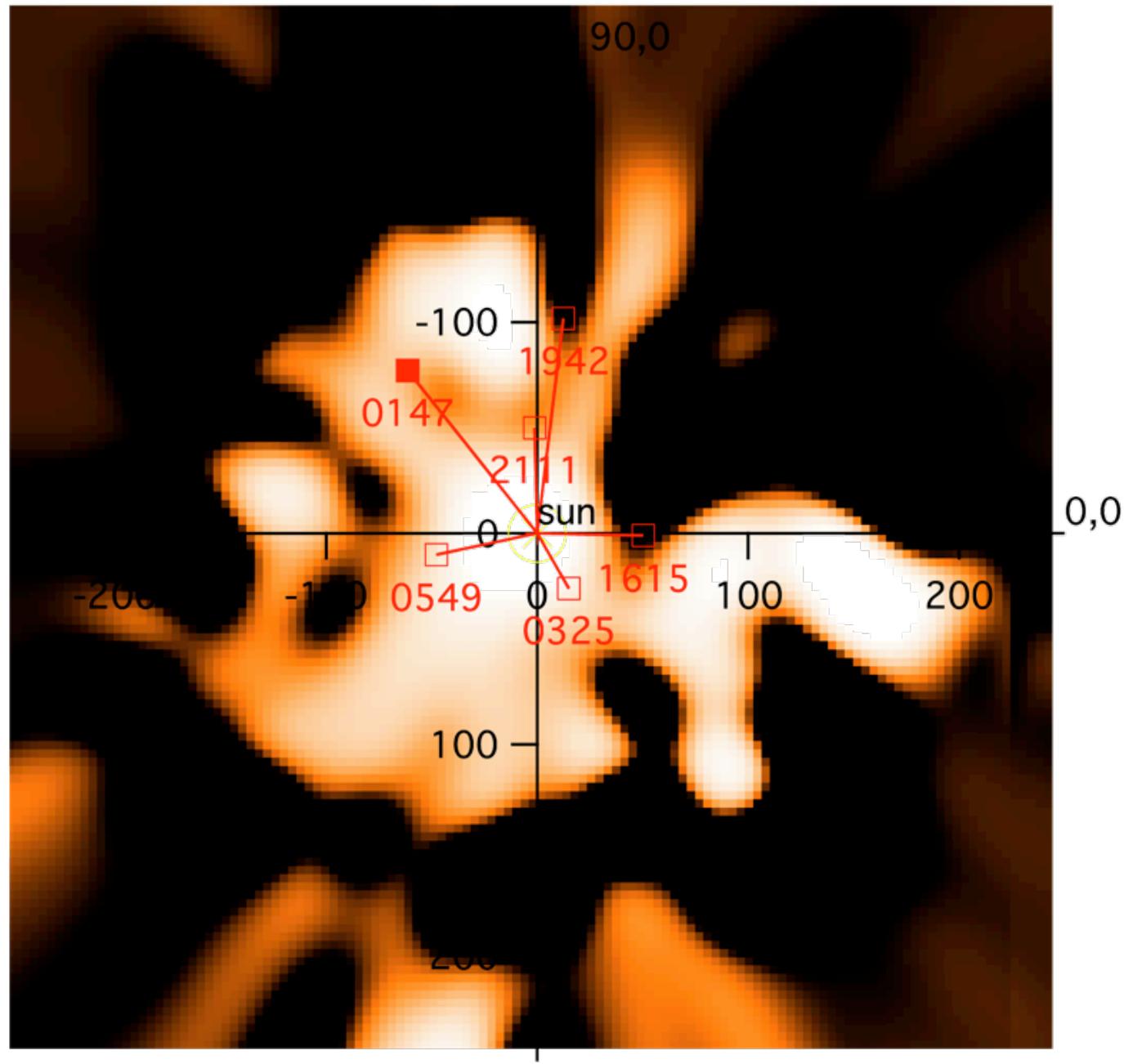
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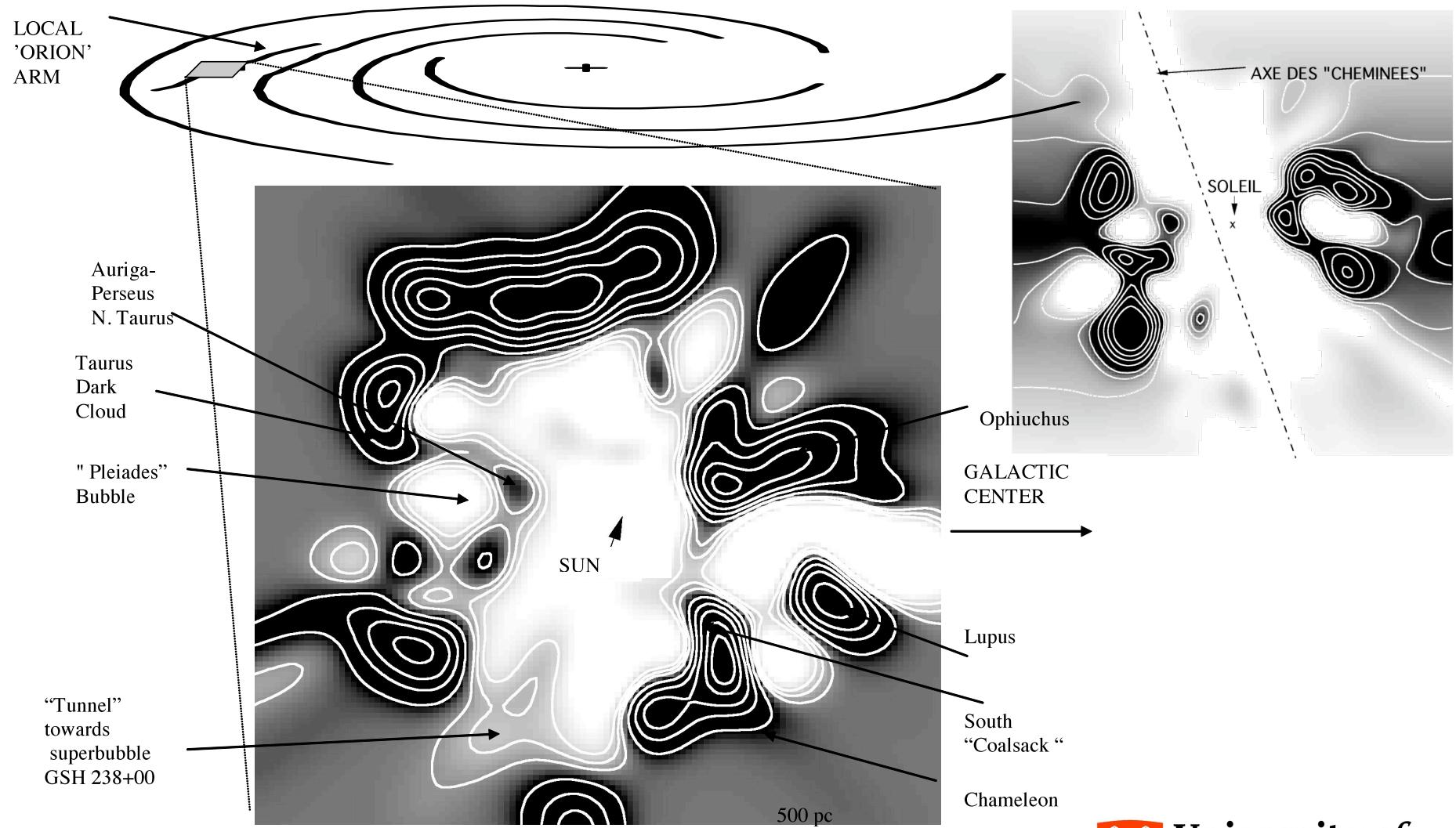
# Summary of Results

- Range of column densities detected
  - $4.5 \times 10^{12} - 4.2 \times 10^{13} \text{ cm}^{-2}$
  - $2.1 \times 10^{12} - 7.6 \times 10^{12} \text{ cm}^{-2}$  (upper limits)
- Range of volume densities
  - $8.8 \times 10^{-9} - 9.8 \times 10^{-8} \text{ cm}^{-3}$
  - Ave =  $4.2 \times 10^{-8}$  (S&L =  $4.6 \times 10^{-8}$ )
- Are we seeing a threshold effect?
  - No detections within  $\sim 50\text{pc}$
  - Densities do not seem to be uniformly distributed
  - Some long lines of sight with no detection, but which are close to detected material!

# Conclusion

- In common with Oegerle et al. + Savage & Lehner
  - distn of OVI is patchy
  - Mainly at high galactic latitude
- In majority of cases OVI is detected in sightline crossing or near a cold cloud

# Density maps of the Local ISM



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